Management of Maintenance Resources

Introduction

Each transit agency should have a plan for the safe and proper management of maintenance resources; including parts, equipment, facilities, fleet, and personnel.

Parts

By keeping a replacement part on hand for every vehicle component, a transit agency would be able to minimize vehicle downtime. However, this would be an expensive practice. Besides the cost of buying a part that is not immediately needed, there are storage and warehousing costs, and a potential future cost if a part becomes obsolete.

Obviously, a more balanced approach is required. All replacement parts should be identified by the frequency of part failures, especially when part failures lead to road calls. If a transit agency can develop accurate parts statistics, it has an opportunity to benefit from cost controls by knowing where a part should be stored. For instance, a part with high failure frequency should be very accessible to the technicians:

Location of Inventory

Part Failure Rate	**Part Source**
High	In-stock
Medium	Local vendor
Low	Remote vendor

Many parts retain a core value even though the part is broken. Suppliers may apply a credit or discount to the customer when the part is replaced if the customer returns the old part. In cases where a transit agency has many vehicles of the same type, it is advisable to keep a few core parts on hand. In addition, consider keeping enough core parts on hand for the remaining service life of a vehicle in cases where a part is becoming obsolete.

Equipment

Machines, Tools and Equipment

Preventive maintenance and proper care of machinery, equipment and tools is essential. Equipment and tools in disrepair pose unnecessary hazards. It is important to place them in their proper designated storage place after use.

Jack Stands

Jack stands should be used whenever the wheels are raised two inches or more off the ground. The vehicle must be lowered onto the jack stands and not suspended over them.

Floor Jacks/Lifting Devices

Care should be taken in instructing all shop personnel on the proper use and positioning of floor jacks and other lifting devices. Lift points should be marked on vehicles.

Equipment Guards

Guards should be installed and used on all equipment with belts or pulleys.

Tire Cages/Inflation Devices

Instructions for mounting/dismounting tires should be posted and strictly followed. Cages or safety inflation devices should be used any time tires are being inflated.

Tools

Tools should be kept clean of grease and oil. The tool should be properly selected for the job with the appropriate hand position and technique used for the employee's protection. Tools should be inspected regularly for defective conditions.

Cords/Hoses

Air hoses, extension cords, and droplights should be inspected regularly for worn or frayed condition. They should be kept in a stored or hanging position when not in use. They should be wiped clean after each use. All cords and electrical equipment should have a grounded plug.

Eyewash Stations

An eyewash station should be provided and located near a water supply.

Fire Extinguishers/First Aid Kit

At a minimum, one fire extinguisher should be available on each shop wall. A first aid kit should be displayed in the shop with easy access for shop employees. Both items should be inspected on a regular basis (first aid kit supplies, fire extinguisher charge and condition). Both items should be labeled indicating their permanent location.

Other Shop Equipment

All shop equipment should be inspected regularly for their condition and cleanliness. Broken or worn equipment (ladders, hoses, stools) should be replaced to eliminate the possibility of injury to an employee.

Facilities

Safety is the most important concern in managing a maintenance facility. Safety must be practiced at all times, and required by management. It is the responsibility of management to ensure that safe practices are in place at all times, and to conduct regular and documented safety meetings. All safety posters and reminders should be posted in the shop. OSHA rules and regulations provide excellent guidance on facility maintenance practices. Sample facility inspection sheets can be found in Appendix N.

Housekeeping

A key ingredient to a safe work environment is good housekeeping. Besides providing a pleasant environment that will improve morale and productivity, good housekeeping helps prevent accidents caused by spills of materials and tools that are carelessly left around. Shops and service areas that are kept neat and clean often require fewer repairs and replacement of expensive items.

Employees should be responsible for cleaning up their spills. All spills should be mopped or cleaned up quickly. Floors and aisles should be swept on a daily basis. Workbenches and other designated work surfaces should be kept free of clutter and cleaned daily. Adequate trash containers should be provided in the shop area and on the fuel island(s). The containers should be emptied daily. The facility lot and fuel island should be kept clean of trash and debris.

Materials and equipment should be stored in designated storage areas that are well maintained and free of clutter. Makeshift sites tend to become cluttered quickly, hampering employee mobility, and adding to the chance of accidents and injury.

Inspect storage racks, shelves and storage equipment regularly for safety and strength. Platforms, stairwells, and walkways should be well maintained to eliminate clutter and spills. Stairwells often become temporary storage areas making them hazardous for all personnel.

A well-kept shop is an essential part of an effective disaster and fire safety program. Dirty, cluttered aisles and floor space prevent a quick exit in the event of an emergency and increases the chance of fire and death.

Shop Access

Access to the shops should be restricted to shop personnel and management only. Signs should be displayed to indicate that it is a restricted area.

No Smoking

Smoking should be prohibited in all shops. Signs should be posted.

Emergency Numbers

Emergency phone numbers should be posted near the shop phone(s).

Emergency Exits

Signs should be posted indicating emergency exits.

Fuel Island

The fuel island should be inspected on a regular basis for defective or worn hoses and nozzles. A fire extinguisher should be kept on the fuel island at all times. At a minimum, the extinguisher should meet class “B” standards (appropriate for use on flammable liquids and gases). However, it is strongly recommended that a class “ABC” extinguisher be used because it can handle a wider variety of fires that might occur. Class “ABC” fire extinguishers are approved for

use with ordinary combustibles (i.e. wood, rubber, plastics, etc.), flammable liquids and gasses, and electrical equipment.

Exhaust Hoses

Hoses should be used when vehicles are running and garage doors are closed. Hoses should be inspected for wear or damage.

Glass

Care should be taken when handling or disposing of glass in the shop. Gloves should be worn when glass is being handled.

Siphoning

Siphoning by mouth is prohibited. Proper pumps should be used to extract gas or other fluids from tanks, barrels, or containers.

Flammables

Proper procedures for handling, storing, and disposing of flammables should be explained to shop employee.

Batteries/Acid

Protective clothing including aprons, gloves, and safety glasses must be worn when filling batteries. The proper storage, handling, and disposal of all batteries is mandatory. Check local and state requirements for disposal.

Jump Start Procedures

Employees should be properly instructed on jump starting procedures, including cable connection and disconnection.

Overhead Clearance

Exhibit caution to avoid striking your head on vehicle mirrors or other projections in and around the shop.

Overhead Doors

Overhead doors should be kept either all the way up or all the way down. Doors should not be left in a partially open or closed position.

Sharp Instruments

Razor blades and other sharp cutting objects should be stored properly in a designated drawer or cabinet. Razor blade holders should be used.

Vehicle Movement

When vehicles are being moved for any reason, including fueling, speed restrictions should be followed. Speed limits should be posted in the shop and throughout the yard. Shop personnel should ask for assistance when backing a vehicle, wear seat belts, and drive with the service door closed. If anyone, including shop or other personnel is on-board, they should be properly seated and not standing in the step well area.

Entry/Exit From Vehicles

Shop personnel should not vault or jump into or out of a vehicle.

Fleet

Physical Inventory

Transit agencies should conduct a physical inventory of equipment and reconcile the results with the equipment records every year. A control system must be developed to prevent loss, damage, or theft of property. Typically a property control number, a serial number, or the vehicle identification number identifies the equipment. Any loss, damage, or theft must be investigated and documented by the transit agency. An example of an inventory sheet is found in Appendix K.

Vehicle history file

Each vehicle should have a written record documenting preventive maintenance, regular maintenance, inspections, lubrication and repairs performed. This record can be duplicated for the service center where the vehicle is based.

Such information is useful for PM services as the part can be ordered and in hand before the vehicle comes in for a scheduled maintenance. As well, parts for road calls can be dispatched with the service truck, saving time and money. A vehicle's history is also valuable in locating persistent problems and may serve to determine if individual driver habits merit particular attention. Sample forms are provided in Appendix L and Appendix M.

Such records shall be maintained for the life of the vehicle and include at a minimum the following information:

- Identification of the vehicle, including make, model, license number or other means of positive identification and ownership;
- Date, mileage, and description of each inspection, maintenance, repair or lubrication performed;
- If not owned by the transit agency, the name of the person or company furnishing service with this vehicle; and
- The name and address of any business firm performing an inspection, maintenance, lubrication or repair.

Fleet life plan

A fleet plan is an internal, working document that can be updated whenever conditions warrant or at least annually. This document should cover five (5) calendar years. The fleet plan addresses replacement and expansion without regard to funding availability. The fleet plan should be based on service needs and economic replacement life. It is used to project new equipment deliveries and disposal, and helps to plan grant activities. It keeps track of spare ratios and can help predict when to augment or reduce parts levels. It helps the transit manager consider vehicle rehabilitation or replacement in lieu of extensive repair and constant unscheduled maintenance.

Contingency fleet plan

Vehicle failures can cause “spikes” in workloads, an increase in operating costs, and potentially interrupt transit service. Transit managers must find a way to skew the schedule of identified services and reduce the impact of failure cycles.

Transit agencies with a contingency fleet of spare vehicles are able to continue transit service while vehicles are in the maintenance cycle. Transit vehicles held in a contingency fleet must be properly stored, maintained, and documented in a contingency plan and updated as necessary.

For fleets with fewer than 50 fixed-route vehicles, and for paratransit fleets, judgment must be applied to determine what is an excessive number of spare vehicles. For fleets with 50 or more fixed route buses, the spare ratio should normally not exceed 20 percent of the vehicles operated in maximum service. Maximum service means the number of revenue vehicles during the peak season of the year; on the week and day that maximum service is provided. It excludes atypical days and one-time special events.

To calculate the spare ratio, divide the number of spare vehicles by the peak requirement (the number of vehicles operated in maximum service). The number of spare vehicles is the difference between the total fleet and the peak requirement.

Transit vehicles may also be stockpiled in an inactive contingency fleet in preparation for emergencies. However, no transit vehicle may be stockpiled before it has reached the end of its service life.

Retrofitting of vehicles

Retrofitting a vehicle with a wheelchair lift or ramp shall not exceed the manufacturer’s gross vehicle weight rating, gross axle weight rating, or tire rating on the accessible bus. The installation of the wheelchair lift or ramp, its controls, and the method of attachment shall not diminish the structural integrity of the accessible vehicle or cause a hazardous imbalance.

No part of the lift or ramp, when installed and stowed, shall extend laterally beyond the normal side contour of the vehicle nor vertically beyond the lowest part of the rim of the wheel closest to the lift. Each wheelchair lift or ramp assembly shall be legibly and permanently marked with the manufacturer’s name, address, and the month and year of manufacture.

NOTE: No vehicle alterations shall lower the road clearance of the vehicle below the manufacturer’s clearance standards.

Personnel

Personnel Safety

The health and well being of every employee is of vital importance. The active participation of each employee is mandatory in establishing a safe work environment. The company should keep the employees aware of required safety and health procedures and the employees should be expected to comply with the prescribed guidelines and procedures.

Personnel Protective Equipment

Employees are required to wear all protective equipment at the proper times and in the proper environments. Failure to wear the required protective equipment should be cause for disciplinary action.

Tool Use/Technique

If the employee is unsure about the proper use of a tool or proper technique, he/she should ask for assistance before using or continuing.

Eye Protection

Eye protection should be worn at all times when under a vehicle, using grinders, buffers, cutting equipment, lathes, and other related tools.

Hearing Protection

Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary. Employees shall be given the opportunity to select their hearing protectors from a variety of suitable protectors provided by the employer.

Hand Protection

Gloves should be worn to protect an employee while handling chemicals, using razor blades, and when welding or cutting. The gloves should extend over the forearms to protect against sparks or chemical splash.

Welding Hood

A welding hood should be worn at all times when welding. Welding goggles should be worn when using cutting torches.

Footwear

Soft-soled shoes are prohibited. A shoe with steel or reinforced toe and a nonskid sole is highly recommended.

Respirators

The company should furnish respirators and require that all mechanics wear them when exposed to lead, volatile organic compounds, or any EPA listed airborne hazardous material. An approved respirator or NIOSH/OSHA approved dust mask must be worn while sanding or grinding any painted or primed surfaces. Respirators should be worn by anyone exposed,

regardless of their distance from the point where the contamination is generated. Respirators should be inspected prior to use for proper exhaust and inhalation valves, cartridge pre-filter, headband adjustment and the overall condition.

Carbon Monoxide Detectors

Carbon monoxide is a colorless, odorless, tasteless and toxic gas produced as a by-product of the combustion in vehicles. It is aggravated by limiting the amount of fresh air flowing into the shop and can cause headaches, dizziness and nausea in employees. Employers should install a carbon monoxide detector that conforms to minimum sensitivity and alarm characteristics as defined by Underwriters Laboratory in UL 2034.

Horseplay

Horseplay is prohibited. Serious accidents and injuries can occur as a result of practical jokes and thoughtless pranks played on unsuspecting workers.

Lifting Technique

Use proper lifting techniques at all times when lifting objects. Bend the knees to utilize leg power and get into a proper position before lifting. Ask for assistance from fellow workers for heavy loads. Avoid twisting and awkward/jerky movements during a lift or while carrying an object.

Push/Pull/Torque

Use caution not to overexert when pushing, pulling or using a torque wrench. Watch the hand clearance closely.

Chemical and waste management

The Federal Hazard Communication Standard (29 CFR Section 1910.1200) is also known as the “Right to Know” law. This standard gives employees a right to know about the hazardous chemicals used in their workplace and is designed to reduce the incidence of chemically related injuries and illness. Employers must develop a written hazard communication program for the workplace, maintain lists of present hazardous chemicals, label all containers of chemicals in the workplace, distribute material safety data sheets to employees, store hazardous chemicals in approved locations, and implement employee training programs regarding hazards of chemicals and protective measures.

Most fleet maintenance facilities generate some hazardous wastes and/or other wastes that are regulated by state or federal environmental programs. Hazardous wastes include those chemicals that are specifically “listed” in the EPA regulations (40 CFR 261.31-33) and/or wastes that exhibit any of the four hazardous characteristics:

- Corrosivity - a pH less than or equal to 2 or greater than or equal to 12. 5. Strongly acidic/alkaline.

- Reactivity - chemically unstable, may react violently with air, water, other chemicals, or wastes that release any cyanide or sulfide. Not commonly encountered at vehicle maintenance facilities.

- Ignitability - liquid with a flash point of less than 140 degrees F. Spent solvents and paint wastes are sometimes hazardous due to ignitability.

- Toxicity - a list of 40 chemicals (heavy metals, pesticides, and organics) specified by EPA. The lab test used to determine toxicity is called the Toxicity Characteristic Leachate Procedure (TCLP). Trichloroethylene, benzene, and lead often make a waste hazardous based on the TCLP.

Spent solvents from parts cleaning operations are an example of a waste generated from vehicle maintenance facilities that often require hazardous management due to ignitability, toxicity, or listing. Some other wastes may or may not meet the definition of hazardous waste but do require special handling. The following provides general guidance for management of some of the more common waste streams:

Waste vehicle lubricants - While generally not a hazardous waste, petroleum-based fluids must still be carefully managed. If kept in clean storage, authorized recyclers (registered with Texas Commission on Environmental Quality) can usually accept used oil and other lubricants, at little or no cost.

Spent batteries - These are commonly recycled, which can be made a condition of the purchase contract. They should be stored in a manner that prevents releases to the environment. Batteries with damaged cases should be containerized to prevent releases. Old batteries should be recycled or disposed within one year of generation.

Scrap tires - Not classified as hazardous waste, but generally are not accepted by landfills unless split, quartered, or shredded. Tire recycling or disposal companies are available to collect used tires for a fee in most areas.

Used oil filters - Should be punctured and thoroughly drained to remove liquids. The recovered oil and filter are recycled separately. Containers used to store filters should be clearly labeled.

Spent solvents - Solvent recycling programs are available in most areas and can reduce the liability associated with disposal. The use of non-ignitable (low flash) solvents for washing parts may result in a non-hazardous waste stream.

Used antifreeze - Draining into the sanitary sewer is generally prohibited by local sewer and pretreatment ordinances. Authorized recyclers can usually pick up used antifreeze. Recycling equipment is available for purchase, but some equipment may not remove all impurities.

Refrigerant - Air conditioning refrigerants must be recycled. Technicians servicing these systems should be certified by an EPA approved training program.

Paint wastes and thinners - Must be sent to an authorized treatment, storage, disposal or recycling facility. Frequently, the companies that service and recycle cleaning solvent can set up a waste stream to pick up paint wastes as well.

Discharge to sanitary sewers - Any discharges, such as vehicle wash water, should comply with municipal discharge ordinances and/or industrial sewage discharge agreements. The discharge of wash bay wastewater to septic systems should be avoided unless the appropriate state or county permits can be obtained.

The Occupational Safety and Health Administration's (OSHA) Hazard Communication Standard, and the Texas Hazard Communication Act are designed to ensure that employers and employees are aware of all chemical hazards in the work place. The Material Safety Data Sheet (MSDS) is the primary source of information on all chemicals used in the workplace. Each time a new product is procured the MSDS should be obtained from the supplier, and placed in a designated location readily accessible to employees. The MSDS contains the physical and chemical characteristics and health hazards associated with the product, as well as handling precautions and emergency procedures.

A product's MSDS should be evaluated prior to purchasing or accepting trial samples of a product. This information can be useful in determining if acceptance of the product poses additional safety concerns or if unused residuals will require disposal as hazardous waste.

Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and material safety data sheets.

Employees shall be informed of any operations in their work area where hazardous chemicals are present, the location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and the material safety data sheets. Employee training shall include at least:

- The methods and observations used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.).

- The physical and health hazards of the chemicals in the work area, including signs and symptoms of exposure to chemicals and any medical condition known to be aggravated by exposure to the chemical.

- The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

- An explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.